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AUTHOR Hill, Kearney H. J.
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ABSTRACT

Futurists claim that computers will change the workplace and the entire society of the United States within the next few years. Already they are making many changes such as displacement of clerical workers and creation of more jobs for programmers and analysts. In the future, the majority of adults will need to be computer literate. However, definitions of computer literacy vary; some hold that computer literacy is the ability to interact with computers and use them, while others believe computer literacy involves only familiarity with computers; still others would define computer literacy as the ability to design and build computers. Despite the differences in definitions, most persons agree that adults need more computer education and that many are trying to get it. The old structures of semester- or year-long college or high school evening classes do not work well for adults. Many adults prefer shorter courses such as those given by computer manufacturers and dealers. Computer dealers often have classrooms built into their showrooms, and adults like to learn in these informal settings. The requirements for computer literacy will continue to increase. Nationally, computer literacy is a societal requirement that could eventually acquire the status of a basic skill. (KC)

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Adult Computer Literacy

Submitted in Partial Fulfillment
of the Requirements for the Course
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by

Kearney H. J. Hill
Kansas State University

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Adult Computer Literacy

According to futurists, there is a new revolution upon us which will affect the way people earn money, spend their leisure time, and relate to one another. These dramatic changes will be the direct outcome of high technology. Some occupational forecasters believe that high technology applications at the work site will be the catalyst for the permanent elimination of up to 45 million jobs once computerized, labor-saving devices become operant. According to Occupational Forecasting, Inc., a consulting firm in Arlington, Virginia, "Robots, automation, communication and computers are changing the entire occupational infrastructure of U. S. industries." (Rodenstein, 1982)

Conversely, John Naisbitt (1985) believes that we are in the midst of a major transformation of our persent industrial economy to one involved in electronics, information and service. Today the electronics/information/service economy is creating new companies and new job opportunities at an uprecedented rate. During the height of the industrial age in the 1950's we were creating new companies at the rate of less than 100,000 a year; in 1984 alone approximately 700,000 new companies were created. As more companies are created, more jobs will be created. There were three million jobs added to the economy in 1983 and an additional four million jobs were added in 1984. In the last two years seven million jobs were created by companies 4 years old or younger. During the same period the Fortune 1000 companies experienced a loss of 300,000 jobs. In Megatrends, Naisbitt predicts that the computer is going to smash the corporate hierarchical management pyramid, created hundreds of years ago, in

which middle managers traditionally relayed information up and down the hierarchy. With the implementation of computers this position will no longer be needed; therefore companies can be built along more horizontal lines. Without these layers in between workers are brought closer to top management. He also contends that this process of replacing middle managers with computers is happening at a faster rate than robots are replacing assembly line workers.

As the United States increasingly becomes an information-oriented society, a computer literate populace is as important as energy and raw materials. The Nations's capital is currently as much into scientific knowledge, computer science in particular, as it is into natural resources (Molnar 1979, Magarrell 1981) therefore Computer technology and Computer literacy are rapidly becoming two of our nations most important resources. About half of the labor force now hold information and computer-related jobs and are earning more than half the labor income; thus information has now become our national commodity. Moreover, our society has become irreversibly dependent on computers, particularly in the areas of business, energy, space exploration, research, and national security. Our ability to use computer technology contributes significently to out nations present and future intellectual and economic strengths.

Need for Computer Literacy

Additionally, in an information society such as ours, widespread understanding of computer technology and the consequences of computer uses and misuse is necessary, even required, for public policymaking. A lack of understanding and acceptance of computers could seriously impede solving important problems. Many observers of the role of

computer technology in society believe that if the gap between current technological capacity and the ordinary person's understanding of the technology is allowed to grow too wide, the social and political, as well as scientific, ramifications are likely to be very serious (Molnar, 1981). Special concern about computers and information systems is justified because of their unique features and their close association with large bureaucratic institutions and the enterprise of science.

Computers are now found in such diverse areas as General Motors automobiles, in hospital diagnostic equipment, in airport towers, and in word processors. They are being used to write movies, diagnose athletic styles, generate music and poetry, control stage lighting, and catalog or simulate practically everything.

The degree to which computer skills is being required in the workplace is overwhelming. Current estimates indicate that shortly over one-half of all jobs will be related to information processing and that virtually all workers will come in contact with computer technology. The level of computer skills required, however, is still hotly debated.

"There is a national need to foster computer literacy ... a nation concerned with its social needs and economic growth cannot be indifferent to the problems of literacy. If we are to reap the benefits of science-driven industries, we must develop a computer literate society." (Molnar, 1979)

Computer Literacy

Computer literacy is not yet in our dictionaries, yet it has immense and far reaching influence on nearly every facet of our lives. Generally defined as understanding a computer and being able to use

one, computer literacy continues to evolve as educators and lay persons alike struggle to sort out what computer literacy includes and what includes computer literacy. Nationally, the discussion continues over what it means to be computer literate. According to some authors (Johnson etal 1980, Klassen etal 1980,) computer literacy:

1. Imparts knowledge about handling information.
2. Dispels fears and myths associated with computers.
3. Develops skills in using and programming a computer.
4. Develops procedural learning.
5. Addresses the ethical and societal issues raised by computing.

Some writers argue in favor of equating computer programming instruction with computer literacy (Rawitsch 1978), while others view computer literacy as just general knowledge about the role of the computer in society. It is our view that to function effectively as a citizen in the 1980's and beyond, one needs to know about the role of computers in society and the elementary concepts and techniques of computer programming. Thus, a true computer literacy program should include social elements as well as whatever else is needed to understand and be able to use computers in some minimal and meaningful way, and should include the following knowledge areas: (Klassen & Anderson, 1980)

1. Applications. This area covers the multitude of social and organizational areas into which computers have been integrated. It also covers the general considerations for applying computers to new situations.
2. Hardware. This domain deals with the basic vocabulary of computer systems components. Just how extensive this knowledge should be

depends upon the social role of the learner.

3. Impact. This domain encompasses the social effects of computerization, including both the positive and negative impacts of computers on society.
4. Limitations. This domain is distinguished from the applications domain because of the focus on developing a general sense of the capabilities and limitations of computing machines. Examples of computer limitations include the fact that computers do not have feelings and consciousness, nor are they able to make value judgements.
5. Programming/algorithms. This domain deals with the ability to read, modify, and construct algoritms and programs.
6. Software and data processing. This area includes vocabulary relevent to software, information processing, and data.
7. Usage. While the foregoing areas are largely cognitive in emphasis, this domain involves motor skills for sequencing and execution of certain tasks on the computer or computer terminal.
8. Values and feelings. The effective domain centers on developing positive attitudes toward personal use of computers as well as balanced attitudes toward computers as a social force.

Statistically, computer literacy is intended for the general public and the majority of computer users (Schimming 1980). The inherent problem in providing computer literacy only to computer users is that it separates those working with computers from the rest of society. The inexpensiveness of microcomputers and their popularity with consumers has significantly heightened national awareness of computing. Computer literacy has become as much a societal issue as an academic one (Logsdon 1980; Houser 1977). Moverover, as computers

are developed that conduct dialogs with people on whatever level of computer literacy they possess, the term "computer literacy" is becoming a relative one. Clearly, computers, both as tool and as medium, offer alternatives that can significantly affect the availability, quality and level of education. At the same time, it should be understood that there will continue to be individuals who have neither the desire nor the need to be computer literate. No one is yet able to predict with any certainty the effects or extent of computer literacy: much more research remains to be done. With robots, home computers, and an emerging satellite television and videodisk industry, the evolution of computer literacy is constant; new application and implications emerge almost daily. All this suggests that computer literacy and the use of computers is leading us into the unknown.

Computers and the Adult learner

In its broadest sense, adult education incorporates a range of instructional and learning activities for individuals who have completed or discontinued their formal preparatory education and have assumed the roles and social responsibilities generally associated with adulthood. Philosophically, adult education is tied to Knowles' (1970) assumption that adults as learners are more experienced, self-directed, problem-oriented, and motivated by the developemental demands of adulthood than are children or adolescents. (Larson 1983) Literature indi ates that, nationally and internationally industry and business have continued to move ahead of education in Computer use and development. Some questions discussed in the monograph by Masat,(1981) are:

1. Will training and continuing education provided by industry and business supplant that of higher education?
2. Is intervention necessary in those States where little or no computer literacy is evolving?
3. Who has national responsibiltiy for computer literacy?
4. What societal impact will literacy have?

In newspapers, magazines, and television advertisements, we can feel the excitement and challenge to create-- which is part of the "high technology revolution." According to these ads, we will all be able to complete tasks, engage in stimulating activities and process information in a way which we were never able before. Yet, at the same time we hear of the tragedies of workers who have spent 20, 30 or 40 years in an industry and have lost their jobs permanently because technology can do their jobs more effectively. How can this conflict be resolved? The answer of course is re-training.

While it is true that introduction of a computer into a company can deprive an employee of his position, a new position is being established. People are needed to design, build and maintain this equipment, to write the required programs and to input the necessary data. A whole field of human factors engineering or ergonomics has blossomed trying to make the computers, the lights, furniture, and terminal keyboards "user-friendly". Possibly the employee could be retained, retrained and then let the computer help match job opportunities to his new abilities.

Employers and employees then need to consider the following questions (Rodenstein, 1982);

- Which jobs will be discarded in my industry?
- Which new occupations will be created in my industry?

- How will these sweeping changes affect the jobs of both blue collar and white collar workers? (e.g. What new skills need to be mastered?)
- What are the challenges and opportunities for the nations's primary trainers of labor, the educational and training systems?
- Should I investigate the possibility of being retrained for emerging or changing occupational clusters which are a direct result of high technology applications? (i.e., robotics, communications, medicine and manufacturing. These occupational categories are by no means inclusive but serve to represent the range of careers which will emerge and/or change as they interface with computers.)

Robots are finding their way into the workplace. In fact, when the data related to sales and production are examined, the scope and impact of robotization is staggering. Robot sales in this country are growing at an annual rate of 35 percent. Optimistic forecasters are predicting general sales of robotized manufacturing equipment in the United States to reach 2 to 4 million by 1990. The following forcasts have also been made:

- By 1985, 20 percent of the labor force in the final assembly of autos will be replaced by automation. (one automobile manufacture alone has announced plans for 14,000 robots by 1990.)
- By 1987, 15 percent of all assembly systems will use robot technology.
- By 1988, 50 percent of the labor in small component assembly will be replaced by automation.
- By 1990, the development of sensory techniques will enable robots to approximate human capability in assembly.

(National Center For Research in Vocational Education. 1982)

According to a recent government report, the largest single class of employees in the United States today have jobs dealing, in the broadest sense, with information processing and communications, and it is well known that computer technology has influenced these areas extensively (Porat, 1977). In addition to the many known uses of computers, it is estimated that there are thousands of appl cations of the computer still awaiting discovery. As a recent TIME article puts it, "Amazing feats of memory and execution become possible in everything from automobile engines to universities and hospitals, from farms to banks and corporate offices, from outer space to a baby's nursery" (TIME, 1978). To ask what these applications are is like asking what are the applications of electricity. There is little doubt, it seems, that life in the United States and in the rest of the industrial world, and eventually all over the planet, will be incalculably changed by computers. With the emergence of the Information Age, individuals are needed not only to work in business using the information tools generated by the new technologies, but also in industries created by the new technologies such as the microcomputer industry. In addition, individuals at all levels in business need to understand the capabilites and limitations of the tools and know how these tools can be used by them or others working for them to generate the information needed.

HOW to EDUCATE

Parents, teachers, accountants, scoutmasters, homemakers, engineers, gas station owners, and farmers all have demonstrable, but different, reasons to develop competencies in computing. Some needs are quite similar while others are unique. No one solution will meet them all.

There is an educational role implied by these forecasts- a role that may not necessarily be played by the public schools, but will certainly pose major policy questions for public school educators. That role is employee retraining and continuing education. As a result of recent demographic shifts - the median age has risen from 28 to 30 since 1970- such new schooling patterns are already emerging. Particularly at the post-secondary level, educational policies and opportunities have been expanded and altered to include many more adults. The trend is likely to continue and to include elementary and secondary schools as well. Retraining will be a by-word of the future employment picture, and continuing education may well be the norm for the 21st Century, as universal education has become in the 20th. Not the least of the key questions to be answered is who will assume responsibility for meeting those continuing education and training needs. Schools? Business and industry? A wholly new parnership between the two? (Thomas, 1983)

At the present time, a single discipline does not exist to address the preparation of individuals for positions in the office of the future; i.e. jobs within businesses related to the development and management of business information systems. Instead, businesses are proceeding by having vendors train personnel on the information tools purchased. Personnel are also being sent to the multitude of seminars being held throughout the country on topics ranging from word processing to networking and data base managment, in an attempt to develop a cohesive business information system. Many firms are spending considerable amounts of money through in-house training programs. Therefore, it is critical that each worker who is part of industry that will soon become computer-controlled examine the options open:

can retraining occur within the industry or will positions be permanently eliminated? If retraining can occur, the most expedient way to get that training should be determined and pursued. We will all be affected by the computer in our jobs one way or another. Determining the effect on each worker's participation in the work force is critical.

There are numerous ways the employee can become proficient in the skills required by computers according to Goddard.(1983)

1. Intrigued by newspaper, magazine, and television features, Americans are registering in record numbers for "computer courses" at an institution of higher learning such as a University, Community College or Technical Institute. Often these courses are designed for an audience other than the general public. Standard course lengths, semester or quarters, have been the rule. However a semester long course in basic computer concepts may not be of use to a person trying to decide whether or not to purchase a personal computer. (Joseph, 1983)

2. The individual can take courses offered by specific computer companies or computer retailing stores. For example, ComputerLand stores often employ a full-time trainer on their staff to offer instructions to individuals and classes and do on-site training as well. Courses offered include word processing, electronic worksheets, database management, and computers in general. Tandy's Radio Shack has also evolved its approach and commitment to nationwide computer literacy by having classrooms where courses and free seminars can be taught by staff instructors to educate the puble at large, thus avoiding the need to tutor every single customer. Courses offered are

determined on a nationwide basis and teaching materials are provided by corporate headquarters. From the inception of the Personal Computer, IBM included classrooms in their PC service centers and now offer courses in the Lotus business application package, word processing, accounting and computer literacy as well as other specified courses. Digital offers computer based, interactive, self-paced instruction on the use of their equipment and applications, which are usually equipment specific and offer computer literacy by training someone to use a computer to do some particular task. (Goddard, 1983)

3. Sony and the educational division of John Wiley and Sons Company have teamed up to develop a computerized, interactive simulation- and training system called the Videodisk Interactive Educational Work Station. Instead of sending employees to distant training centers, a company can now provide courses at home base. It can save two-thirds or more of retraining expenses because it uses a personalized, interactive laser-disk player system. (Doherty, 1985)

4. New innovative methods of instruction will result from the introduction of microprocessor technology and the networking technology made possible through telecommunications. A greater number of students will be able to be served by vocational and technical educators. In particular, those adults gainfully employed who are interested in updating their knowledge and skill or in retraining will be able to receive instruction via a networking system in their community, at their workplace, or within their homes. In the past, adults often were inconvenienced and had to make sacrifices in order to prepare for their changing job roles. (Rodenstein & Lambert, 1982)

While the trend in the last decade has been for major corporations to

provide in-house training programs for employees, the trend may reverse itself if vocational and technical educators take the lead, meet with business personnel to find out what type of education and training programs they perceive to be critical, and use the communications technologies available to deliver the programs. Through an increase in its market share, vocational and technical institutions will be able to afford the new information tools required for instruction.

Reynolds draws almost the same conclusions but states it a little differently (Reynolds, 1985):

After introducing computers in the schools adults became interested in learning about computers. Some are parents who just wanted to keep up to with their kids; others are finding that their jobs may depend on knowledge of computers. Some adults who need to use computers on the job learn on the job, others attend Vo-Tech schools, Community College and Continuing education programs. Even Colleges and Universitiys are offering a variety of courses for the adult. Several school districts across the country make their computers available to adults after school hours. If the Computer Education Assistance Act of 1984 had been enacted more communities would have access to computers. Developing a variety of computer competancy levels is one of the greatest challengs facing education today. Traditional courses do not appear to be the answer. A cohesive series of short modules, integrated to allow students to select those which lead to the levels of competency they desire provide an effective, managable approach. Recognizing this gap in adult training, Fox Valley Technical Institute (FVTI) in Appleton, Wisconsin, is responding with a modular series of

courses, designed to build a variety of computer competency levels. Of special interest are the forecasts concerning education; home schooling, computerized instruction, satellite communication, life-long "in and out" educational patterns- changing expections, changing roles, changing schools. In short, it is suggested that the universal public education system that forms the backbone of United States industrialized society may not adequately serve the needs of the emerging post-industrial nation. Many believe that the information technologies developing so rapidly are more conducive to flexible, individualized, and decentralized instruction and less appropriate to the standard, centralized systems we now have. Thus, then the underlying theme is a very basic question: What is public education's role in the future?

Another example of computer inspired good works exists: A small chain of computer stores in Northern New Jersey has offered free Computer workshops to the unemployed as a way for them to ascertain whether a computer career was a viable option. The chain offers "hands on seminars for Technolphodes" on the premise that everyone needs to know something about computers, and that some people need more encouragement to learn than others.(Thomas, 1983)

Various incentives used are non-traditional. With some exceptions, customer education is learning for its own sake. However, the store's motives are usually less pure; it offers courses to bring in potential buyers and to make money both from the courses and from the equipment the customer is likely to purchase. There is also no formal method of evaluation and no reward, except the intrinsic one of being able to say " I did this". A recent artical in Fortune magazine states that "80% of the computer specialty stores offer training" in a little,

computer-equipped, glass-walled classroom at the rear of the store. (Goddard, 1983) This informal interactive atmosphere is conducive to instruction as well as camaraderie.

The area of home computer use promises to be a significient area for the development of adult education offerings from a variety of vendors. A thorough understanding of the motivation, users, and limitations of the home user will be a necessary ingredient in developing sound programs. At the moment, the best educational efforts for such a consumer are being conducted by user organizations and through a variety of books and magazines. (Hiemstra & Tucker, 1982) These efforts are meeting only a portion of the needs for guidance and understanding of the home user. A particular need of many new purchasers is instruction in the use of software package which require familiarity with a variety of commands incorporated in the package.

Another interesting prediction is one made by Alvin Toffler in an interview with Popular Computing. He predicts that one-fifth of the American labor force will be working from home instead of commuting to a central location within the next 10 to 20 years (Wollman, 1982). He also envisions that education will quite natually shift from the schoolroom to the home and the computer and television will be linked up for interactive or two-way systems.

Therefore the real challenge for adult educators today may be to not let this revolution become just another fad that passes through the historical annuals of education.(Hiemstra & Tucker, 1982) In other words, we must learn how we can make the best use of computers rather than how can they help us. Reaching the vast market of adults

learners takes on the different meaning when such a goal is kept in mind.

CONCLUSION

It has many names: The "Third Wave," the "Micro Millennium," the "Computer Revolution," the "Information Revolution." Whatever the title, the changes affecting the world and the results of these radically different technologies are recognized as profound and comprehensive, on par with the agricultural and industrial revolutions of the past.

Over the last few years, the computer has found its way into practically every American Business. It has simplified and systemized many time consuming activities. It has provided the manager with current, up-to-date information from which to make decisions. In this competitive world of business, those who can make valid decisions based on current information will, no doubt, endure, while those who can not will, undoubtedly, find themselves seeking new employment or retraining. Within the next ten years the use of computers will be required for any business to remain competitive. Through mass production, increased technology, and fierce competition, the price of a personal computer continues to decline. Like the telephone or even the television set, a computer is now financially possible for millions with the continued promise of even lower prices.

The definition of "Computer Literacy" is as diverse as are the occuptations of the individuals who employ computers. To one it might indicate someone who can use computers for a specific purpose; to another, being able to build a computer might be a requirement for being "Computer Literate." Still others contend that it involves knowledge of the role of computers in society and the concepts and

techniques required to program and operate a computer

In addition the development of personal computing promises to have as great an impact on our society as the development of the printing press on late medieval society. Why is the computer revolution here to stay? For one reason, personal computers are becoming more powerful all the time. Each new generation (perhaps every five years) results in a product with more memory, more capability, more user ease, and more miniaturization. The increasing portabiltiy equates the personal computer in many ways to the product of the printing press. The increasing power of personal computers also suggests that breakthroughs in terms of interactive capability and software are just around the corner.

Some questions that must still be answered are: What is computer literacy? What are the implications of computer education? Where will computer literacy be used? What is the curricular place of computer literacy?

The impact of microcomputers is being assessed, as is the extent to which computer sciences and literacy are increasing in other countries. The findings indicate that microcomputer use and the demand for computer literacy will continue to increase.

Nationally, computer literacy is a societal requirement. Given the continuing success of computer literacy at the elementary and secondary levels, computer literacy in higher education could, in time, acquire the status of a basic skill.

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